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L4: Entry 1 of 2

File: JPAB

Mar 2, 1999

PUB-NO: JP411059135A

DOCUMENT-IDENTIFIER: JP 11059135 A

TITLE: PNEUMATIC TIRE

PUBN-DATE: March 2, 1999

INVENTOR-INFORMATION:

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COUNTRY

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ASSIGNEE-INFORMATION:

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COUNTRY

TOYO TIRE & RUBBER CO LTD

APPL-NO: JP09240346

APPL-DATE: August 20, 1997

INT-CL (IPC): B60 C 11/12

ABSTRACT:

PROBLEM TO BE SOLVED: To discharge stones caught in a minor groove to the outside by forming a plurality of conveying protrusions having the saw tooth-shaped section on a groove bottom part or a groove wall part of the minor groove.

SOLUTION: Conveying protrusions 17 for conveying and discharging caught stones are formed on a groove bottom part 84 of a lateral groove 8. The conveying protrusions 17 have the saw tooth-shaped section and are inclined in a direction in which the sectional width of the lateral groove 8 is increased. The stones caught in the lateral groove 8 are pressed to the groove bottom part 84 by perpendicular force from the road surface in relation to a tire in ground contacting. The stones are advanced in the lateral groove 8 while pushing down the saw tooth-shaped conveying protrusions 17, the stones are not returned to the original position through the lateral groove 8 since the conveying protrusions 17 are inclined in one direction, and the stones are moved toward a circumferential main groove 2. When the stones reach the circumferential main groove 2, they are discharged from the circumferential main groove 2 to the outside of the tire by gravity or centrifugal force.

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L4: Entry 2 of 2

File: DWPI

Mar 2, 1999

DERWENT-ACC-NO: 1999-224855

DERWENT-WEEK: 199922

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TITLE: Tread structure in pneumatic tyre, used on e.g. bus - has saw tooth shaped protrusions formed along groove wall

PATENT-ASSIGNEE:

ASSIGNEE

TOYO RUBBER IND CO LTD

CODE

TOYF

PRIORITY-DATA: 1997JP-0240346 (August 20, 1997)

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PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<input type="checkbox"/> JP 11059135 A	March 2, 1999		005	B60C011/12

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
JP 11059135A	August 20, 1997	1997JP-0240346	

INT-CL (IPC): [B60 C 11/12](#)

ABSTRACTED-PUB-NO: JP 11059135A

BASIC-ABSTRACT:

NOVELTY - A horizontal groove (8) of the tyre tread portion has saw tooth shaped protrusions arranged at its bottom portion (84) along a groove wall (85) which are inclined in the direction in which the cross-sectional width is increased.

DETAILED DESCRIPTION - The protrusion has a top portion and from its base on both sides the walls of a shape of a saw tooth are formed. The wall surface are inclined in the same direction as that in which the cross-sectional width of the groove is increased. The protrusions incline towards the groove where the cross-sectional width is wide or towards the slot where the cross-sectional width is narrow.

USE - Tyres used on heavy vehicles, such as bus and truck.

ADVANTAGE - The stones entering the sub-slot can be ejected easily. The cross-sectional dimension of a slot is not narrowed hence fundamental tyre properties like damage and control stability are not inhibited.

CHOSEN-DRAWING: Dwg.2/4

TITLE-TERMS: TREAD STRUCTURE PNEUMATIC TYRE BUS SAW TOOTH SHAPE PROTRUDE FORMING
GROOVE WALL

DERWENT-CLASS: A95 Q11

CPI-CODES: A12-T01B;

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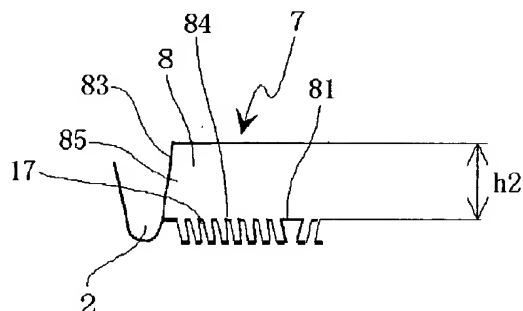
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(54) 【発明の名称】 空気入りタイヤ

(57) 【要約】

【課題】 走行中、タイヤ踏面部の周方向主溝に開口し又は開口しない副次溝に噛み込んだ石を容易に外部に排出することができる。

【解決手段】 タイヤ踏面部1に周方向主溝2、3、4に開口する副次溝である横溝6、8を備え、上記副次溝である横溝6、8の溝底部84に、断面形状が鋸歯状である搬送突起17を複数形成する。



【特許請求の範囲】

【請求項1】 タイヤ踏面部に周方向主溝と当該周方向主溝に開口し又は開口しない副次溝を備えた空気入りタイヤにおいて、上記副次溝の溝底部及び又は溝壁部に、断面形状が鋸歯状である搬送突起を複数形成したことを特徴とする空気入りタイヤ。

【請求項2】 搬送突起が、断面形状において、副次溝の溝底部をなす頂部と、頂部の両側から基部に向けて延び鋸歯の歯の壁面を構成する2つの壁面部と、突起の根元を構成する基部とから構成され、頂部から基部方向に降ろした法線に対して上記2つの壁面部がいずれも同じ側に傾斜している請求項1記載の空気入りタイヤ。

【請求項3】 溝の断面幅が漸次拡大する副次溝を備えており、搬送突起が溝の断面幅が拡大する方向に傾斜する請求項1又は2記載の空気入りタイヤ。

【請求項4】 搬送突起は、溝の断面幅が狭い副次溝から溝の断面幅が広い副次溝又は周方向主溝に向かって傾斜する請求項3記載の空気入りタイヤ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は空気入りタイヤにおいて、特にそのタイヤ踏面部表面に形成された副次溝の石噛み防止の改良に関する。

【0002】

【従来の技術】従来、本発明者は、タイヤ、特にトラック・バス用タイヤでは、走行中、タイヤ踏面部表面に形成された溝が路面から石を噛み込むことから、この噛み込んだ石を溝から排除する技術を提案した（特開平5-85110号）。

【0003】すなわち、特開平5-85110号は、溝の溝底部に、断面積が大きく深い溝に向かって傾斜するサイブを形成する技術である。従って、この傾斜サイブの形成により溝底部が分断されていることから、噛み込まれた石を押し込む接地圧力によってこの溝底部を前傾状態にて前倒し的に変形させ、噛み込まれた石を排出していくものである。

【0004】

【発明が解決しようとする課題】しかし、タイヤ踏面部の周方向主溝に開口し又は開口しない副次溝は、溝幅の大きい周方向主溝と異なって、溝幅が狭く、特にタイヤ幅方向に配置されている副次溝の場合、タイヤの回転に応じて、溝を挟んで隣接するタイヤ踏面部の陸部同士が路面からの接地圧力の作用を受けて当該溝にて石を噛み込みやすい構造をなしている。

【0005】従って、上記のサイブを溝の溝底部に形成したタイヤでも石の排出は可能であるが、さらに一層噛み込んだ石を副次溝から排出できる構造とすることが望ましい。

【0006】本発明の課題は、走行中、タイヤ踏面部の周方向主溝に開口し又は開口しない副次溝に噛み込んだ

石を一層容易に外部に排出することができる空気入りタイヤを提供するところにある。

【0007】

【課題を解決するための手段】上記課題を達成するため鋭意検討した結果、本発明は、タイヤ踏面部に周方向主溝と当該周方向主溝に開口し又は開口しない副次溝を備えた空気入りタイヤにおいて、上記副次溝の溝底部又は溝壁部に、断面形状が鋸歯状である搬送突起を複数形成する構成を採用した。

10 【0008】従って、副次溝の溝底部又は溝壁部に断面形状が鋸歯状である搬送突起を複数形成した本発明のタイヤの場合、副次溝内にその両側の溝壁部を押し広げながら噛み込まれた石は、接地時、タイヤに対する路面からの垂直方向力により溝底部に押しつけられ、また同垂直方向力によるトレッドゴムの変形によって溝壁部に挟み込まれる。この溝底部及び溝壁部に押しつけられた石は、更に鋸歯状の搬送突起を押し倒しながら副次溝内を進入して行く結果、押し倒された搬送突起の頂部の移動に伴って、噛み込まれた石は押し倒された側に移動して行く。そして、タイヤの回転で非接地状態即ち離地時になると、溝に噛み込まれた石に対する上記の垂直方向力及び圧縮力は開放されると共にタイヤの回転による遠心力が働く結果、倒れた搬送突起は元の位置に還元しようとするが、当該搬送突起は一方に傾斜していること及び押し広げられた溝の溝壁からの摩擦力で溝の長さ方向の動きが押さえられる。このため、噛み込まれた石は元の位置にもどり難くなる。従って、次の接地時、再び、この噛み込まれた石は、次の搬送突起を押し倒しながら副次溝内を進入して行き、押し倒された搬送突起の頂部の移動に伴って押し倒された側に移動する。タイヤ回転ごとにこの移動が繰り返される結果、溝に噛み込まれた石はより溝幅の広い副次溝又は周方向主溝に移動して行く。そして、溝幅の広い副次溝又は周方向主溝において、かかる石に対して作用していた拘束力がなくなり、重力又は遠心力によって溝からタイヤ外部に排出される。

【0009】なお、本発明でいう「副次溝」とは、タイヤ踏面部に周方向に連続して連なる周方向主溝以外の溝を示している。従って、この周方向主溝に開口しタイヤ幅方向に延びる横溝等の溝のほか、周方向主溝に開口しない溝も含まれる。因って、例えば周方向主溝に開口する1次溝に対して開口する2次溝等の副次溝も含まれる。また、溝幅乃至溝深さとの関係から、溝幅の狭いサイブ、スリット等の細溝乃至切り込み溝も含まれる。要するに、石噛みを起こす、周方向主溝以外の溝をすべて含んでいる。

【0010】

【発明の実施の形態】図1は本発明に係る空気入りタイヤの一実施形態に係るトレッドパターンを示す概略平面図である。図2は図1における空気入りタイヤのX-X

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線概略半断面図である。図3は同タイヤにおける横溝の溝底部の要部拡大概略断面図である。図4は同タイヤの横溝における石噛み状態を示す概略断面図で、図4

(A)は接地時における石噛み状態を示す図、図4

(B)は離地時における石噛み状態を示す図、図4

(C)は次の接地時における石噛み状態を示す図である。

【0011】図1において、1はタイヤ踏面部、2はタイヤ踏面部のタイヤセンター領域に設けられたジグザク状の周方向主溝、3、4はタイヤ踏面部のタイヤショルダー側領域に設けられた略ストレート状の周方向溝である。

【0012】5はジグザク状の周方向主溝2と略ストレート状の周方向溝3との間に設けられたブロックであり、タイヤ幅方向において略V字状に折れ曲がった副次溝である横溝6によって区画されている。また同じく、7はジグザク状の周方向主溝2と略ストレート状の周方向溝4との間に設けられたブロックであり、タイヤ幅方向において略逆V字状に折れ曲がった横溝8によって区画されている。

【0013】横溝6、8は、図示の通り、いずれも中央部61、81において、溝幅が最も狭く、周方向溝3、4に開口する開口端62、82及び周方向溝2に開口する開口端63、83において溝幅が最も広がっている。

【0014】なお、図1において、9、10はそれぞれブロック5、7表面においてタイヤ幅方向に形成されたサイプである。サイプ9は、略V字状に折れ曲がった横溝6とほぼ平行に周方向溝2から切り込まれてブロック5の中央部をタイヤ幅方向に延びる一端開口一端閉塞型のサイプである。また、サイプ10は略逆V字状に折れ曲がった横溝8とほぼ平行に周方向溝2から切り込まれてブロック5の中央部をタイヤ幅方向に延びる一端開口一端閉塞型のサイプである。

【0015】11、12はそれぞれタイヤショルダー領域を構成するショルダーリップである。ショルダーリップ11には、図示の通り、周方向主溝3を挟んで前記横溝6にはほぼ連続する形でタイヤ幅方向に延びる横溝13がタイヤ周方向に間隔を置いて繰返し設けられている。また、この横溝13、13の間には、タイヤ幅方向に延びるサイプ14が、横溝13と同様にタイヤ周方向に間隔を置いて繰返し設けられている。ショルダーリップ12にも、周方向主溝4を挟んで前記横溝8にはほぼ連続する形でタイヤ幅方向に延びる横溝15がタイヤ周方向に間隔を置いて繰返し設けられている。また、この横溝15、15の間には、タイヤ幅方向に延びるサイプ16が横溝15と同様にタイヤ周方向に間隔を置いて繰返し設けられている。

【0016】図1及び図2において、84は副次溝である横溝8の溝底部、85は同横溝8の溝壁部である。横

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溝8の溝底部84には、噛み込まれた石を搬送して排出するための搬送突起17が形成されている。搬送突起17は、断面形状が鋸歯状となっており、図3に示す様に、断面形状において、副次溝である横溝8の溝底部84をなす頂部171と、頂部171の両側から基部172に向けて延び鋸歯の歯の壁面を構成する2つの壁面部173、174と、突起の根元を構成する基部172とから構成され、頂部171から基部172方向に降ろした法線Nに対して上記2つの壁面部がいずれも同じ側に傾斜している。この実施形態の搬送突起は、概ね台形に近い裁頭状の不等辺三角形形状をなしている。なお、本発明の搬送突起は、上記の壁面部173、174のみならず、横溝8の溝壁部85側も同溝壁部85に連続して一体形成されていないため、石噛みに応じて独立して押し倒され易い構造となっている。但し、本発明の搬送突起は、横溝8の溝壁部85側も同溝壁部85に連続して一体形成した構造でも差し支えない。しかし、石噛みに応じて押し倒され易い構造としては、少なくとも搬送突起の頂部を、横溝8の溝壁部85から独立した非連続の構造とすることが望ましい。

【0017】また、搬送突起17は横溝8の断面幅が拡大する方向に傾斜している。従って、図2に示す様に、横溝8の中央部81を境界として搬送突起17の頂部171が開口端82、83に向かう方向にてそれぞれ反対方向に傾斜している。

【0018】なお、本実施形態のタイヤは、横溝6にも同様の搬送突起18が形成されており、横溝8と同様に、搬送突起18は横溝6の中央部61を境界として搬送突起18の頂部が開口端62、63に向かう方向にてそれぞれ反対方向に傾斜している。

【0019】従って、図4(A)に示す様に、副次溝である横溝8内にその両側の溝壁部85を押し広げながら噛み込まれた石19は、接地時、矢印で示されるタイヤに対する路面からの垂直方向力20により溝底部84に押しつけられ、また押し広げられた溝8のその変形反力によって溝壁部85に挟み込まれる。この溝底部84及び溝壁部85に押しつけられた石19は、更に鋸歯状の搬送突起17を押し倒しながら横溝8内を進入して行く結果、押し倒された搬送突起17の頂部171の移動に伴って、噛み込まれた石19は押し倒された側に移動して行く。

【0020】次に、タイヤの回転で非接地状態即ち離地時になると、溝に噛み込まれた石19に対する垂直方向力20及び圧縮力は開放され、またタイヤの回転による遠心力が働く結果、図4(B)に示す様に、倒れた搬送突起17は元の位置に復元しようとするが、当該搬送突起17は一方に傾斜していること及び押し広げられた溝の溝壁85からの摩擦力で横溝8の長さ方向の動きが押さえられる。従って、噛み込まれた石19は元の位置にもどり難くなる。

【0021】従って、図4(C)に示す様に、次の接地時、再び、この噛み込まれた石19は、搬送突起17を押し倒しながら横溝8内を進入して行き、押し倒された搬送突起17の頂部171の移動に伴って更に押し倒された側に移動する。

【0022】この様に、タイヤ回転ごとにこの移動が繰り返される結果、溝に噛み込まれた石19は周方向主溝2に移動して行く。そして、周方向主溝2において、かかる石19に対して作用していた拘束力がなくなり、重力又は遠心力によって周方向主溝2からタイヤ外部に排出される。

【0023】この排出メカニズムは、副次溝である横溝に形成された搬送突起の傾斜方向によって、排出される周方向主溝が異なることはいうまでもない。

【0024】上記の実施形態の搬送突起は、溝底部に形成していたが、溝壁部に形成しても同様の効果が達成される。また、溝底部と溝壁部両方に形成することもできる。

【0025】更に、上記実施形態の搬送突起は、周方向主溝に向かって傾斜する構造であったが、上記タイヤと異なるトレッドパターンを備えたタイヤの場合では、例えば溝の断面幅が狭い副次溝から溝の断面幅が広い副次溝にむけて搬送突起の傾斜方向を採用することもできる。

【0026】図3に示す様な搬送突起の高さh1は、特に限定されるものではないが、図2に示す様に、搬送突起が形成されている副次溝である横溝8の最大深さh2の0.1~0.3倍で充分実施可能である。

【0027】また、図2に示す様な搬送突起の頂部-頂部間のピッチPも特に限定されないが、副次溝の最大深さの0.1~0.3倍で充分実施することができる。

【0028】なお、副次溝に搬送突起を形成するには、トレッド模様を成型する金型内面に鋸歯形状のブレードを設けてグリーンタイヤを加硫成形することによって達成される。また、成形タイヤの副次溝の溝底部乃至溝壁部を切削加工することによっても搬送突起を得ることができる。製造方法は格別限定されない。

【0029】

【実施例】図1に示す構造のタイヤサイズ285/75R24.5のタイヤを試作し、運送用トラックの後輪に装着して10万マイル走行後の石噛みの実際個数と石噛み痕(溝深くに入り込み傷痕として残っているもの)の合計数を数えた。比較のため、溝に搬送突起を備えていない以外は同構造である比較例1タイヤと、搬送突起の代わりに同位置にサイブを形成した比較例2タイヤもそれぞれ試作して、実施例タイヤと同様の上記の石噛みの評価をした。表1はその結果を示している。なお、石噛みの評価は比較例1タイヤの上記合計数を100として指数表示している。値が小さいほど、石噛み防止が優れ

ていることを示している。

【0030】

【表1】

	実施例1	比較例1	比較例2
石噛み指数	8	100	15

【0031】表1より、副次溝の溝底部に搬送突起を複数形成した実施例タイヤは、比較例1タイヤより良好な石噛み防止効果が得られていることが認められる。また、副次溝の溝底部にサイブを形成した比較例2タイヤよりも更に良好な石噛み防止効果が得られている。

【0032】

【発明の効果】以上の通り、本発明は、タイヤ踏面部の副次溝の溝底部及び又は溝壁部に、断面形状が鋸歯状である搬送突起を複数形成した空気入りタイヤであるので、走行中、副次溝に噛み込んだ石を容易に外部に排出することができる。

【0033】また、本発明のタイヤは、タイヤ踏面部の副次溝の溝底部及び又は溝壁部に、断面形状が鋸歯状である搬送突起を複数形成する構造であるから、副次溝の溝の断面寸法を狭める要素がなく、因って排水性や操縦安定性等の基本的なタイヤ性能を阻害することもない。

【図面の簡単な説明】

【図1】本発明に係る空気入りタイヤの一実施形態に係るトレッドパターンを示す概略平面図である。

【図2】図1における空気入りタイヤのX-X線概略断面図である。

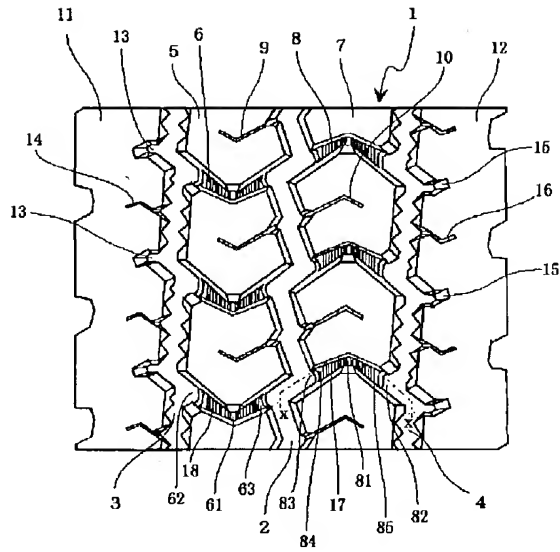
【図3】同タイヤにおける横溝の溝底部の要部拡大概略断面図である。

【図4】同タイヤの横溝における石噛み状態を示す概略断面図で、図4(A)は接地時における石噛み状態を示す図、図4(B)は離地時における石噛み状態を示す図、図4(C)は次の接地時における石噛み状態を示す図である。

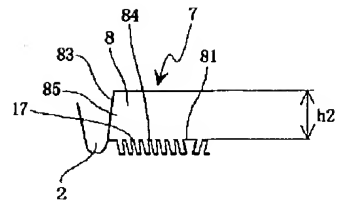
【符号の説明】

- 1 タイヤ踏面部
- 2 周方向主溝
- 3 周方向主溝
- 4 周方向主溝
- 6 横溝(副次溝)
- 8 横溝(副次溝)
- 84 溝底部
- 85 溝壁部
- 17 搬送突起
- 171 頂部
- 172 基部
- 173 壁面部
- 174 壁面部
- 18 搬送突起

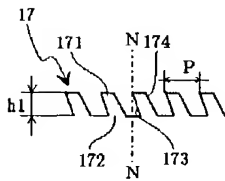
【図1】



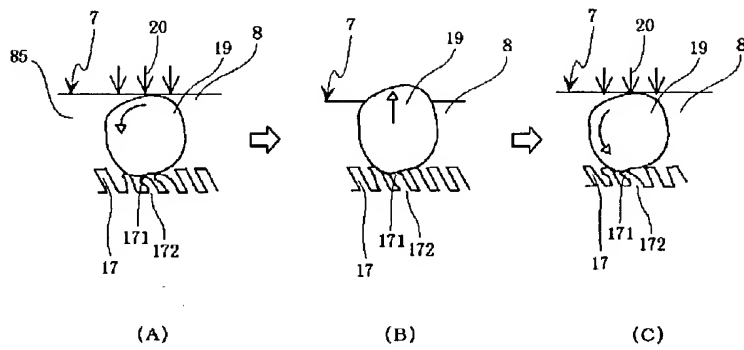
【図2】



【図3】



【図4】



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to amelioration of ***** prevention of sub**** formed in the tire tread section front face in a pneumatic tire.

[0002]

[Description of the Prior Art] Conventionally, with the tire, especially the tire for truck buses, during transit, since the slot formed in the tire tread section front face bit the stone from the road surface, this invention person proposed the technique which eliminates this bit stone from a slot (JP,5-85110,A).

[0003] That is, JP,5-85110,A is a technique which forms SAIPU toward which the cross section inclines toward a trench in the groove bottom section of a slot greatly. Therefore, bend this groove bottom section forward in the state of anteversion according to the ground pressure force which pushes in the bit stone from the groove bottom section being divided by formation of this dip SAIPU, a target is made to deform, and the bit stone is discharged.

[0004]

[Problem(s) to be Solved by the Invention] However, unlike the hoop direction major groove with a large flute width, sub**** which carries out opening to the hoop direction major groove of the tire tread section or which does not carry out opening to it has a narrow flute width, and, in sub**** arranged especially crosswise [tire], is making the structure where the land parts of the tire tread section which adjoins across a slot are easy biting a stone in the slot concerned in response to an operation of the ground pressure force from a road surface, according to the revolution of a tire.

[0005] Therefore, it is desirable to consider as the structure which can discharge the stone bit further further from sub**** also with the tire which formed above-mentioned SAIPU in the groove bottom section of a slot, although blowdown of a stone is possible.

[0006] The technical problem of this invention is in the place which offers the pneumatic tire which can discharge still more easily outside the stone bit to sub**** which carries out opening to the hoop direction major groove of the tire tread section or, which does not carry out opening to it during transit.

[0007]

[Means for Solving the Problem] In order to attain the above-mentioned technical problem, as a result of inquiring wholeheartedly, in the pneumatic tire equipped with sub**** which carries out opening to a hoop direction major groove and the hoop direction major groove concerned or which does not carry out opening to the tire tread section, the configuration which forms in the groove bottom section or the groove face section of the above-mentioned sub**** two or more conveyance projections whose cross-section configurations are serrate was used for this invention.

[0008] therefore, the case of the tire of this invention which formed in the groove bottom section or the groove face section of sub**** two or more conveyance projections whose cross-section configurations are serrate -- secondary -- at the time of touch-down, the stone bit while extending the groove face section of the both sides to degree Mizouchi is pushed against the groove bottom section by the perpendicular direction force from the road surface to a tire, and is put between the groove face section by deformation of the tread rubber by this perpendicular direction force. while the stone pushed against this groove bottom section and the groove face section pushes down a further serrate conveyance projection -- secondary -- as a result of advancing and going degree Mizouchi, with migration of the crowning of the pushed-down conveyance projection, the bit stone moves to the pushed-down side and goes. And although it be going to restore the fallen conveyance projection to the original location as a result of the centrifugal force by the revolution of a tire work while the above-mentioned perpendicular direction force and the compressive force over the stone bit by the slot be open if it become in the condition , i.e. , **** , do not ground , by the revolution of a tire , a motion of the die length direction of a slot be press down by that the conveyance projection concerned incline in the one direction , and the frictional force from the groove face of a slot which be able to extended . For this reason, the bit stone stops being able to return to the original location easily. therefore -- while this bit stone pushes down the next conveyance projection again at the time of the next touch-down -- secondary -- degree Mizouchi is moved to the side which advanced, went and was pushed down with migration of the crowning of the pushed-down conveyance projection. As a result of repeating this migration for every tire revolution, the stone bit by the slot moves to sub**** with a more wide flute width, or a hoop direction major groove, and goes. And in large sub**** or the hoop direction major groove of a flute width, the restraint which was acting to this stone is lost and it is discharged by gravity or the centrifugal force from a slot to the tire exterior.

[0009] In addition, "sub****" as used in the field of this invention shows slots other than the hoop direction major groove which continues and stands in a row in the tire tread section in a hoop direction. Therefore, the slot which does not carry out opening to a hoop direction major groove besides slots, such as a transverse groove which carries out opening to this hoop direction major groove, and extends crosswise [tire], is also included. Therefore, sub****, such as a secondary slot which carries out opening, for example to a hoop direction major groove to the primary slot which carries out opening, are also contained. Moreover, a striation thru/or slitting slots, such as SAIPU with a narrow flute width and a slit, are also included from the relation between a flute width thru/or a channel depth. In short, all slots other than a hoop direction major groove from which ***** is started are included.

[0010]

[Embodiment of the Invention] Drawing 1 is the outline top view showing the tread pattern concerning 1 operation gestalt of the pneumatic tire concerning this invention. Drawing 2 is X-X-ray outline half section drawing of the pneumatic tire in drawing 1. Drawing 3 is the important section amplification outline sectional view of the groove bottom section of the transverse groove in this tire. Drawing 4 is the outline sectional view showing the ***** condition in the transverse groove of this tire, and drawing in which drawing 4 (A) shows the ***** condition at the time of touch-down, drawing in which drawing 4 (B) shows the ***** condition at the time of ****, and drawing 4 (C) are drawings showing the ***** condition at the time of the next touch-down.

[0011] In drawing 1, the hoop direction major groove of the letter of zigzag by which 1 was prepared in the tire tread section and 2 was prepared in the tire pin center, large field of the tire tread section, and 3 and 4 are the hoop direction slots of the shape of an abbreviation straight prepared in the tire shoulder side field of the tire tread section.

[0012] 5 is the block established between the hoop direction major groove 2 of the letter of zigzag, and the abbreviation straight-like hoop direction slot 3, and is divided by the transverse groove 6 which is sub**** which bent in the shape of abbreviation for V characters in the tire cross direction. Moreover, similarly, 7 is the block established between the hoop direction major groove 2 of the letter of zigzag, and the abbreviation straight-like hoop direction slot 4, and is divided by the transverse groove 8 which bent in the shape of abbreviation reverse V character in the tire cross direction.

[0013] All have [transverse grooves 6 and 8] the narrowest flute width in center sections 61 and 81 as a graphic display, and the flute width is the largest in the opening edges 63 and 83 which carry out opening to the opening edges 62 and 82 and the hoop direction slot 2 which carry out opening to the hoop direction slots 3 and 4.

[0014] In addition, in drawing 1, 9 and 10 are SAIPU formed crosswise [tire] in block 5 and seven front faces, respectively. SAIPU 9 is SAIPU of the end opening end lock out mold which is mostly cut by parallel deeply from the hoop direction slot 2 with the transverse groove 6 which bent in the shape of abbreviation for V characters, and is prolonged crosswise [tire] in the center section of the block 5. Moreover, SAIPU 10 is SAIPU of the end opening end lock out mold which is mostly cut by parallel deeply from the hoop direction slot 2 with the transverse groove 8 which bent in the shape of abbreviation reverse V character, and is prolonged crosswise [tire] in the center section of the block 5.

[0015] 11 and 12 are shoulder ribs which constitute a tire shoulder field, respectively. As the graphic display, on both sides of the hoop direction major groove 3, the transverse groove 13 which extends crosswise [tire] keeps spacing in a tire hoop direction, and is repeatedly established in said transverse groove 6 at the shoulder rib 11 in the form which continues mostly. Moreover, among these transverse grooves 13 and 13, like the transverse groove 13, SAIPU 14 prolonged crosswise [tire] keeps spacing in a tire hoop direction, and is prepared repeatedly. In the form which also follows the shoulder rib 12 mostly on both sides of the hoop direction major groove 4 in said transverse groove 8, the transverse groove 15 which extends crosswise [tire] keeps spacing in a tire hoop direction, and is repeatedly established in it. Moreover, among these transverse grooves 15 and 15, like the transverse groove 15, SAIPU 16 prolonged crosswise [tire] keeps spacing in a tire hoop direction, and is prepared repeatedly.

[0016] In drawing 1 and drawing 2, the groove bottom section of the transverse groove 8 whose 84 is sub****, and 85 are the groove face sections of this transverse groove 8. The conveyance projection 17 for conveying and discharging the bit stone is formed in the groove bottom section 84 of a transverse groove 8. The conveyance projection 17 is set in a cross-section configuration, as the cross-section configuration is serrate and it is shown in drawing 3. The crowning 171 which makes the groove bottom section 84 of the transverse groove 8 which is sub****, and the two wall surface sections 173 and 174 which are prolonged towards a base 172 from the both sides of a crowning 171, and constitute the wall surface of the gear tooth of a serration, it consists of bases 172 which constitute the bottom of a projection, and each of two above-mentioned wall surface sections inclines in the same side to the normal N taken down in the base 172 direction from the crowning 171. The conveyance projection of this operation gestalt is making the shape of a scalene triangle of ***** near a trapezoid in general. In addition, since not only the above-mentioned wall surface sections 173 and 174 but the groove face section 85 side of a transverse groove 8 follows this groove face section 85 and is not really formed, the conveyance projection of this invention has structure which is easy to be pushed down independently according to *****. However, the conveyance projection of this invention does not interfere with the structure which the groove face section 85 side of a transverse groove 8 also followed this groove face section 85, and really formed it, either. However, it is desirable to make the crowning of a conveyance projection into the discontinuous structure which became independent of the groove face section 85 of a transverse groove 8 at least as structure which is easy to be pushed down according to *****.

[0017] Moreover, the conveyance projection 17 inclines in the direction which the cross-section width of face of a transverse groove 8 expands. Therefore, as shown in drawing 2, the crowning 171 of the conveyance projection 17 inclines in the opposite direction towards going to the opening edges 82 and 83 bordering on the center section 81 of the transverse groove 8,

respectively.

[0018] In addition, the conveyance projection 18 also as a transverse groove 6 with the same tire of this operation gestalt is formed, and the conveyance projection 18 inclines in the opposite direction bordering on the center section 61 of the transverse groove 6 like a transverse groove 8 towards the crowning of the conveyance projection 18 going to the opening edges 62 and 63, respectively.

[0019] Therefore, at the time of touch-down, the stone 19 bit while extending the groove face section 85 of the both sides in the transverse groove 8 which is sub****, as shown in drawing 4 (A) is pushed against the groove bottom section 84 by the perpendicular direction force 20 from the road surface to the tire shown by the arrow head, and is put between the groove face section 85 by the deformation reaction force of the slot 8 which was able to be extended. While the stone 19 pushed against this groove bottom section 84 and the groove face section 85 pushes down the further serrate conveyance projection 17, as a result of advancing and going the inside of a transverse groove 8, with migration of the crowning 171 of the pushed-down conveyance projection 17, the bit stone 19 moves to the pushed-down side, and goes.

[0020] Next, although it is going to restore the fallen conveyance projection 17 to the original location as shown in drawing 4 (B) as a result of opening the perpendicular direction force 20 and compressive force over the stone 19 bit by the slot and the centrifugal force by the revolution of a tire working, if it becomes in the condition, i.e., ****, of not grounding, by the revolution of a tire A motion of the die-length direction of a transverse groove 8 is pressed down by that the conveyance projection 17 concerned inclines in the one direction, and the frictional force from the groove face 85 of a slot which was able to be extended. Therefore, the bit stone 19 stops being able to return to the original location easily.

[0021] Therefore, as shown in drawing 4 (C), this bit stone 19 moves the inside of a transverse groove 8 to the side which advanced, went and was further pushed down with migration of the crowning 171 of the pushed-down conveyance projection 17 again at the time of the next touch-down, pushing down the conveyance projection 17.

[0022] Thus, as a result of repeating this migration for every tire revolution, the stone 19 bit by the slot moves to the hoop direction major groove 2, and goes. And in the hoop direction major groove 2, the restraint which was acting to this stone 19 is lost, and it is discharged by gravity or the centrifugal force from the hoop direction major groove 2 to the tire exterior.

[0023] It cannot be overemphasized that the hoop direction major grooves discharged by the dip direction of the conveyance projection formed in the transverse groove this blowdown mechanism of whose is sub**** differ.

[0024] Although the conveyance projection of the above-mentioned operation gestalt was formed in the groove bottom section, the same effectiveness is attained even if it forms in the groove face section. Moreover, it can also form in both the groove bottom section and the groove face section.

[0025] Furthermore, in the case of the equipped with a different tread pattern from the above-mentioned tire tire, although the conveyance projection of the above-mentioned operation gestalt was structure which inclines toward a hoop direction major groove, it can also adopt the dip direction of a conveyance projection towards sub**** with the wide cross-section width of face of a slot, for example from sub**** with the narrow cross-section width of face of a slot.

[0026] Although especially the height h1 of a conveyance projection as shown in drawing 3 is not limited, as shown in drawing 2, it can be enough carried out by 0.1 to 0.3 times of the maximum depth h2 of the transverse groove 8 which is sub**** in which the conveyance projection is formed.

[0027] Moreover, although especially the pitch P between the top-crownings of a conveyance projection as shown in drawing 2 is not limited, it can carry out enough by 0.1 to 0.3 times of the maximum depth of sub****.

[0028] In addition, in order to form a conveyance projection in sub****, it is attained by preparing the blade of a serration configuration in the metal mold inner surface which casts a tread pattern, and carrying out vulcanization shaping of the Green tire. Moreover, a conveyance projection can be obtained also by carrying out cutting of the groove bottom section thru/or the groove face section of sub**** of a shaping tire. The manufacture approach is not limited exceptionally.

[0029]

[Example] the tire size 285 of structure / tire of 75R24.5 shown in drawing 1 was made as an experiment, the rear wheel of the truck for carriage was equipped, and the ***** number after 100,000-mile transit and the total number of ***** (slot thing which was deeply alike, entered and remains as a scar) were counted. For the comparison, except not equipping a slot with the conveyance projection, example of comparison 1 tire which is this structure, and example of comparison 2 tire which formed SAIPU in homotopic instead of the conveyance projection were also made as an experiment, respectively, and carried out the same above ***** as an example tire. A table 1 shows the result. In addition, ***** sets the above-mentioned total number of example of comparison 1 tire to 100, and is indicating by the characteristic. It is shown that ***** prevention is excellent, so that a value is small.

[0030]

[A table 1]

	実施例 1	比較例 1	比較例 2
石噛み指数	8	1 0 0	1 5

[0031] From a table 1, it is admitted that the ***** prevention effectiveness with the example tire better than example of comparison 1 tire which formed two or more conveyance projections in the groove bottom section of sub**** is acquired. Moreover, the ***** prevention effectiveness still better than example of comparison 2 tire which formed SAIPU in the groove

bottom section of sub**** is acquired.

[0032]

[Effect of the Invention] the above passage -- this invention -- the groove bottom section of sub**** of the tire tread section -- and -- or since it is the pneumatic tire which formed in the groove face section two or more conveyance projections whose cross-section configurations are serrate, the stone bit to sub**** can be easily discharged outside during transit.

[0033] moreover, the tire of this invention -- the groove bottom section of sub**** of the tire tread section -- and -- or since a cross-section configuration is the structure which forms two or more conveyance projections which are serrate, there is no element which narrows the cross-section dimension of the slot of sub**** in the groove face section, and, therefore, fundamental tire engine performance, such as wastewater nature and driving stability, is not checked in it

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] the pneumatic tire equipped with sub**** which carries out opening to a hoop direction major groove and the hoop direction major groove concerned or which does not carry out opening to the tire tread section -- setting -- the groove bottom section of the above-mentioned sub**** -- and -- or the pneumatic tire characterized by forming in the groove face section two or more conveyance projections whose cross-section configurations are serrate.

[Claim 2] The pneumatic tire according to claim 1 with which each of two above-mentioned wall surface sections inclines in the same side to the normal which the conveyance projection was constituted from a crowning which makes the groove bottom section of sub****, the two wall surface sections which are prolonged towards a base from top both sides, and constitute the wall surface of the gear tooth of a serration, and a base which constitutes the bottom of a projection in the cross-section configuration, and took down in the direction of a base from the crowning.

[Claim 3] The pneumatic tire according to claim 1 or 2 which inclines in the direction which the cross-section width of face of a slot is equipped with sub**** expanded gradually, and the cross-section width of face of a conveyance projection fang furrow expands.

[Claim 4] A conveyance projection is a pneumatic tire according to claim 3 which inclines toward sub**** with wide cross-section width of face or the hoop direction major groove of a slot from sub**** with the narrow cross-section width of face of a slot.

[Translation done.]